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Address Delivered by W. M. Hays, Assistant Secretary of Agriculture, Before the National Farm Land Congress, Chicago, Illinois, Nov. 17, 1909.

The United States Department of Agriculture is Uncle Sam's agency for cooperating with farmers in increasing the products of the farm, the comforts of the home, and the civilization of the rural community. We are indebted to the Congress of 1892 for three great laws, namely: (1) the home-land law, which crystallized in America the plan for the family farm; (2) the fundamental law creating the Department of Agriculture, which established agricultural research and cooperation; and (3) the land-grant college law, which inaugurated agricultural and industrial education in the States. As a nation we are just beginning to realize the importance to our country people and to our nonagricultural communities alike of the country-life development inaugurated by these laws.

During the succeeding half century an expenditure of more than \$34,000,000 in agricultural research has produced a body of new knowledge which has already captured the nation. This new knowledge of the soil, of crops, of live stock, and of the forest, is the basis of a new system of vocational education which has begun to create a nation of expert farmers. The railroad and farm machinery helped us to occupy the land, to cultivate it on the extensive plan, to pay mortgages, to erect improvements; and incidentally to gain an increase in the value of land. We now have thirty million farm people on six million farms, with a farm property worth nearly thirty billion dollars, and an annual product worth nearly eight billion dollars. Twenty millions of farm workers and farm home makers and ten millions of farm youth with all this vast equipment, and this world's most wonderful opportunity for country life, have now become ready to receive the light which agricultural science is bringing to illuminate Uncle Sam's land.

In half a century the United States Department of Agriculture has grown from a mere beginning to an institution with over 11,000 employees. Congress supplies it with an annual income for its expenditure in the neighborhood of \$16,000,000, and a much more is spent by the States in their agricultural departments, colleges, and experiment stations. Of its employees, nearly 3,000 are scientists, hundreds are administrative officers, and thousands are clerks and helpers. There are a dozen Bureaus, ranging in expenditure from \$60,000 to \$1,000,000. These workers, for the most part organized into groups to carry forward specific projects, have come into touch with every man of the economic, educational, and even social problems of our rural communities. They have a most vital relation to the fifty State experiment stations, to the fifty colleges of agriculture, the nearly seventy-five State agricultural high schools, and several hundred consolidated rural schools, and are slowly gaining a vital relation to the hundreds of thousands of our district rural and city schools of country and city. This Department is constantly increasing its efforts with the many great national, State, and local societies interested in the improvement of agriculture and the uplifting of the country people. In many ways it is useful to these cooperative organizations which prepare farm products for the market, or which are performing collectively other functions which the individual farmer can not so well perform for himself. It has a most extensive and potential connection with the farmers through its own publications and through the periodicals and other publications not under public auspices.

The time has come when it may be said that the United States Department of Agriculture, State experiment stations, and schools in which the recreation of agriculture is taught have accomplished an entire change in the view-point of the American people. The value of research and of scientific agricultural education has been demonstrated. The action of the Congress of 1892 has been fully justified, and the achievements of half a century have gained a nation's faith that our country life is to continue its rapid pace toward improved conditions.

Managing the expenditure of \$5,000,000 in meat inspection, food inspection, and the eradication of diseases, all under scientific methods, is an administrative problem of unusual proportions. But the really large and complex function of the Secretary of Agriculture is the administration of seven or eight million dollars devoted to investigations and to improvement of methods of agriculture and of plant and animal production on the farm. The intricacies of an organization which crisscrosses thousands of men, who, with the ingenuity and somewhat of the methods of inventors, are following new lines of scientific research, and are cooperating with fifty State experiment stations and with many other organizations and individuals, could at first seem bewildering were there not much method used in the administrative organization. It has been truthfully said that the Secretary of Agriculture reviews a wider range of general and technical administrative questions than any other man in the nation except the President. The present administration of the Department has demonstrated that its most important function is so to organize the Department's research work that the leaders who are actually guiding the research projects may have the full impulse of freedom to work out new truths and new methods.

The field of the United States Department of Agriculture has a scope even wider than the land territory of this country. Its agents seek useful plants and animals in all climes and search the world for facts. Its Weather Bureau, for example, not content to study the weather after they reach our shores, has outposts beyond our own borders for the making of observations, and by exchanging data with other countries, it keeps in daily touch with the air currents of the entire north half of the earth. This makes it practicable to forecast the weather both for land and sea. No less comprehensive are the arrangements for distributing the predictions of weather to millions of people daily. Ship owners are told when to avoid storms, farmers are told of frosts to come, and transportation companies are warned of cold waves which might destroy perishable products in transit. Science, as applied to the art of weather forecasting, is being built up and a great body of statistical knowledge concerning the climate has been made available to the home builder and health seeker.

A new soil science is being rapidly evolved. Based on this, the soil areas of the entire country are being mapped and systems of crop rotation and of farm organization which will give the best returns are being devised for each area. The causes of those unfavorable mechanical conditions and those toxic conditions in the soil which render manures, fertilizers and tillage keep up soil productivity are being more clearly determined. The facts discovered indicate that the fertility that crops wear out on the basis of mineral plant food supply in our soils is much overdrawn. Attention is being directed to the conservation of soils which are liable to injury by erosion and to farming and manuring so as to permanently increase the productivity of all fields. The fundamental facts as to how to build up worn out soils and as to how to prevent soils from becoming unproductive are being ascertained, and the functions of fertilizers and manures are being better understood. Uncle Sam's entire soil area is being brought under scientific investigation. Science is determining which areas should be in forest, in range, or pasture, in permanent meadow, or in arable fields. Approximately 160,000,000 acres of our soils have been mapped, or one-eighth of the billion and a quarter of acres of our whole area of farm lands. These maps include seven hundred types of soils and will eventually include hundreds more, each area requiring a different soil and crop treatment.

Statistics of the income from and the cost under each plan of farming now being gathered give an analysis of the details and the financial returns, and will show which systems of farming permanently give the largest profits. In all this work the conviction is constantly forced upon all that complete scientific knowledge of farming is a necessity, and that this knowledge must be made available to every man or woman who manages an acre; in other words, that vocational education in agriculture must be provided for all farm youth.

Since science and education are the curative agency, they must be applied vigorously and generally, and not so much through the introduction of a new class of farmers as by giving the present farm population the new point of view of successful practice derived by scientific knowledge.

A dozen years ago approximately a thousand scientists and teachers formed the skeleton army designed by Uncle Sam and the States to build up a science of agriculture and to carry it to the people. Now there are several thousand, with a rising demand for tens of thousands, mainly as teachers of agriculture in the local schools. That soils may be depleted by erosion no one doubts, but that the wearing out of soils through the removal of plant food by crops has been much exaggerated is also clear. Nothing is more certain than the fact that most soils can be kept up and increased in productivity while paying crops are removed. That the science of the future, carried by an efficient system of education to all farmers, will assure both large crops and soils growing constantly more productive none can justly doubt. Projects already inaugurated assure us that our long general agricultural survey will include, together with a description of climate, soils, vegetation, and fauna, the checker plans for the agriculture and the country life of each region. No region will be without its local scientific knowledge, nor without the local ideals for the farm nor its near-by types of splendid homes, nor will it be remote from a splendid example of the organization of the community of the countryside.

While the Department of Agriculture is empowered to cooperate with the States in gaining a knowledge of the wild game birds and animals and in protecting useful birds and animals for the whole people, it is also charged with the control and destruction of all predaceous insects, birds, and animals, including vermin. The help rendered in reducing the losses from wolves, gophers, rats, and mice alone would pay for the price of a good-sized department of agriculture; but the greater work is the investigations and the police control work which lead to the reduction of weeds in our fields, and of diseases of our crops and animals. Not stopping here, the Department aids the national and State efforts in the eradication of animal diseases communicable to man. And with the Department directs most of its energies to economic ends, sometimes work is done of general scientific interest which may prove of value to have large economic value. Thus the studies of the life histories of mosquitoes made easy the discovery of the relation of these insects to that insect to yellow fever and made possible the control of that dread pest by destroying the mosquitoes. In a present case the mapping of the zone inhabited by certain ground squirrels and the invention of methods for their destruction will come in good play in preventing these animals from remaining permanently the hosts of leas which transmit the bubonic plague to people, as do the fleas of rats. The area occupied by the infested squirrels being known, and the means of destroying them having been devised, they, as well as the rats in the near-by city, can be destroyed and the source of infection removed.

The work with plant diseases and insects is illustrated by the modern science of spraying, which is guided on the one hand by a knowledge of the life history of both host and parasite, and on the other by a knowledge of the effects of the poisons when applied at the critical time. America has apples, plums, and grapes of excellent quality because of entomology and plant pathology; and our meats are not nearly as high priced as they would be had our animal pathologists and sanitary veterinarians not eradicated foot-and-mouth disease, pleuro-pneumonia, and swine, and held in check hog cholera, chicken cholera, and various other diseases. The importation of animals from most countries is absolutely prohibited. The Department of Agriculture has to its credit that important medical discovery that insects carry disease to animals. And that initial discovery of the facts with which the cattle tick is concerned is now leading to the eradication of Texas fever from the entire South at the rate of 25,000 square miles, or half a State, per annum. A recent brilliant invention of vaccination for hog cholera promises to make possible the control and the eradication of that pest. The eradication of the larger part of Texas fever, hog cholera, sheep and cattle scab, and blackleg in calves promises to effect a saving of more than fifty millions of dollars annually, or a billion dollars every twenty years.

Science applied to the reduction of tuberculosis in animals has as its goal the saving of approximately twenty millions of dollars annually, now lost in diseased cattle and swine, and the reduction of the sources of infection of the white plague to man. Sanitation, the boiling of milk fed to young animals, the quarantine of infected animals, and even the breeding of strains of animals resistant to this disease are all coming more and more under scientific research and direction.

In the case of injurious insects, their eradication is effected where that can be done, as in the case of the cattle tick; or is kept down to a minimum. In other cases farm practice is so changed as to avoid injury from the insect, as by sowing winter wheat later to escape the egg-depositing season of the beetle, or by cut-

ting the first crop of clover for hay so that the second crop is in flower at a time when the covered seed insects are not ready to destroy the seed crop. Where these remedies can not be applied, insecticides help to combat the pests and very often make for success where otherwise the crops would fail. I know of no scientific service which I admire more than that which works with the minutiae of life histories of insects and minute plants and devises remedies for application against injurious species.

Some of the notable achievements along the line of introducing new plants are the seedless orange and the big wheat, sorghums, alfalfa, and other crops suited to the dry-land farming of the semiarid plains, and Japanese rice for the rice regions of the South. In the apple-growers, plants thus introduced through public agencies give increased values amounting to hundreds of millions annually. Of even larger scope plant breeding, and it is conservatively estimated that plans of plant breeding now in vogue will ere long be so developed as to add hundreds of millions of dollars annually to the crop product of our country.

Among the large achievements of the Department and the institutions with which it cooperates is the production of varieties of plants resistant to diseases which have rendered the growing of the parent stocks impracticable. Thus, disease-resistant cowpeas, cottons, cantaloupes, flax, and cereal grains have been produced. And the world is ready to receive evidence that animals resistant to such diseases as tuberculosis can also be produced by scientific breeding. The start in the case of public expenditure in aiding and directing scientific breeding of domestic animals is illustrating the fact that cooperation along this line may be worth tens if not hundreds of millions of dollars annually.

The Department works not only with the details of agriculture, but with the broad phases of farming as a business. None of the Department's work is of more direct financial benefit to the farmer, nor does more to increase the total of farm production, than efforts directed toward assisting the farmer to make a plan under which to efficiently organize his farm business. The day of scientific engineering in making farm plans with maps which permanently project forward crop rotation schemes and provide simple cost-keeping methods in placing farm business on the systematic plane of other organized business. Choosing suitable crop rotation schemes for the dry-farming region of the plains and the sloping of the science of farming where the conservation of a small rainfall is the controlling factor is of nation-wide importance because of our large dry-land area. Helping the country farmer to select his farm operations that he may secure larger crops through having more vegetable matter in his soils; and that his family may have the better living and the larger profits afforded by a diversified agriculture, is not only of vital importance to the South but also of very great interest to the entire country. Assisting the settler on irrigated lands, and the specialist in some particular phase of farm production, wherever he may be, on the whole covers a wide and diverse field of effort. Reintroducing live-stock farming and the really effective use of manures and fertilizers on the so-called worn-out lands of the East, and broad and comprehensive farm organization schemes which will give larger returns on the high-priced land and the high-priced labor in the middle West, are among the great and truly difficult problems being solved by national and State agricultural research.

It is not too much to say that the \$5 per acre, or approximately a billion dollars, could be actually added to our farm products if our farms could be reorganized under the guidance of the best science we now know. The work of demonstration farming to show the simpler elements of farm management to the farms of a thousand counties in the South is a stroke of educational policy which makes for a better southern agriculture. The work of fertilizing out the best farm schemes, of putting them to the test by comparison of statistical records kept on practical farms through a series of years, and by means of long-continued plot experiments, comparing one rotation scheme with another by the experiment stations, is destined to make an epoch in our knowledge of how to lay out a farm business and how to conduct its daily occupations under scientific engineering plans with simple records which will make it possible to discard all but those farm projects which are most profitable per acre and per worker.

But the Department does not stop with production. It has extensively undertaken the work of assisting producers to prepare their products for market. In many ways the Department and cooperative State institutions assist in marketing products from the milk of the cow and placing them on the market under the most favorable conditions. Many new devices and methods, both of manufacture and of cattle breeding, have been added to that brilliant invention made by Doctor Babcock of the Wisconsin Experiment Station for testing the butter fat in milk. The scientific revolution in the cleanly production of milk and the manufacture and marketing of butter, cheese, and milk make one of the inspiring features resulting from the introduction of science into agriculture. And bureaus of scientists and administrative officers to carry this work to completion are being rapidly organized throughout all the States.

Nowhere is there a better example of the cooperation between the Government, State, and local organizations and the individualistic farm owner than is shown in the California Fruit Growers' Exchange.

Nowhere in our industries is there a better example of the application of science to industry than in the systematic organization of the business and the routine detail of harvesting, grading, cleaning, packing, cooling, storing, and shipping the \$5,000,000 worth of citrus fruits of southern California.

If there is a knotty problem or a doubtful question in the manufacture of canned fruits, vegetables, or meats; in the drying of fruits, or in the storage or transportation of grains, cotton, or perishable products, scientists and administrative officers are set about assisting the industry. The invention of a device for the easy determination of moisture in grain is one of the steps which are marking the advance in the methods of grading and transporting our grain crops. The establishment of grades of cotton with permanent samples supplied to every market is another example. Much assistance has been given to the manufacture of sugar from sugar cane and sugar beets. One of the newest efforts at assisting in preparing farm products for the market is in devising manufacturing plants to be used by associations of farmers in making denatured alcohol.

About one-fourth of the lands of the Department of Agriculture is used to insure to the American people and to their foreign customers pure and cleanly foods and drugs which are labeled true to name. Thus the physical well-being of all people is being conserved in a way thought impossible a decade ago. Congress has not given to the Department a great police function. Inspectors in all abattoirs which ship across State lines or to foreign countries require that only healthy animals be selected for meat and that the packing and curing be done in a cleanly and sanitary way. The labeling feature of the Pure Food Law has done more to bring about common honesty in trade along all lines than any law ever before put on our statute books. The clerical inspection service of the Department has also been a large factor in bringing about honesty in business along all lines, including contracts with the departments of the Government. Many States are enacting pure food and meat inspection laws, and Congressmen have inaugurated a movement for a general labeling law to cover all commodities. Most manufacturers and dealers are by instinct and by training honest. That they are no longer compelled to act a lie so as to avoid having their profits destroyed by unscrupulous competitors is the greatest boon to a fair-minded race of business men. That the people can now pay a seemingly higher price and yet get more for their money is a boon to the consumer and have food for their families. At one stroke this law removed an unfair advantage which middlemen were making by taking as between the producer of raw products and the consumer of finished foods and drugs. And the land is no longer infested with medical fakers as it was a few years ago. Drugs needed in sickness can now be secured which are true to the name with no wrong statement as to their strength or quality.

One of the most widely recognized achievements of the Department of Agriculture is the formation in the public mind of a demand for a public forest policy, and the organization of a Forest Service which is rapidly becoming adequate to take care of our immense public and private timber crop. The forest conservation movement is snatching our forested acres out of the condition of land devastation to which they seemed doomed, as the Chinese forests were destroyed. Our forests are made useful to those who live near them, to those who utilize the waters they conserve, to all who use wood products, and to all who need the larger amount of food which can be grown beside forested areas. The saving in the prevention of forest fires which cost us thirty millions of dollars annually would alone pay the expenses of administering the national forests for a decade. Our 850 million acres of original forests, reduced to 650 million, of which only 200 million now carry mature virgin forests, with 350 million in all degrees of dilapidation because of a wasteful lumbering and forest fires, represent a present value of approximately 7,500 million dollars, one-fifth of which, or one and a half billion dollars, is on public forest lands. Congress is gradually building up a public service to care for the nearly 200 million acres of national forests, in area nearly as large as the States of Iowa, Missouri, Kansas, Nebraska, and Illinois, only about half of which is covered with merchantable timber. At present something over a hundred trained foresters and twenty-eight hundred helpers administer this vast property.

As an outgrowth of the management of our forest lands a great movement has grown up to better conserve our public waters and water powers, that these may be used to the best advantage and remain permanently a source of profit to all the people. The Department has built up a splendid service to cooperate in the reclamation of nonpublic lands needing drainage and irrigation. The Department's engineers are assisting States and organizations controlling land needing irrigation in making plans to reclaim tens of millions of acres. There are in this country 13,000,000 acres under irrigation and nearly 40,000,000 more acres for which there is water to irrigate. Assistance has been given in making plans for the drainage of nearly eight million acres, and it is estimated that there are nearly eighty million acres mainly in private lands which need drainage. Nowhere is the Department's service better appreciated than where it has helped to make bad lands fertile and habitable.

The Department does not confine its real estate betterment operations to the new and unsettled lands. It has a most profound interest in and helpful relation to the wonderful movement mainly centered in the States for the building of permanent roadways throughout the farming regions of the country. It investigates the materials suitable for making roads in each locality. Its engineers aid in planning the location and the form of construction for roads and bridges. They assist in directing sentiment and in devising laws which annually improve the local provisions for the public highways of the respective States. It educates engineers who become employees of State good roads departments. The Department gives assistance also in relation to other rural real estate improvements, as in the erection of barns, silos, creameries, fruit shipping houses, and buildings of other classes. Plans of buildings thus made by architects in the public service may well serve to inaugurate a school of American rural architects.

Year by year the demand grows on the part of producers, consumers, and especially manufacturers and merchants, that more and more of the statistics on which current prices of farm products are made to be gathered by public agencies. To meet this demand the Department of Agriculture supplements annually the quinquennial reports of the Bureau of the Census with estimates of the acreage of each crop and of the number of each class of live stock. As the different crops develop, periodical estimates of the condition of each are given. By this means the Department has shown those who buy and sell that current statistics are the only guide to the fields of harvest, made under public auspices, and the only safe guide to price making in our great world markets. It has demonstrated that these public statistics should go into detail and should be so organized as to cover world areas. Of large value also are statistics of the cost of production of cotton, corn, live stock, and other farm products, and of their transportation to the markets; of agricultural production and consumption in the United States and in the world; and also of the wages of farm labor.

In thousands of projects the United States Department of Agriculture, the State agricultural experiment stations, colleges and schools, and nonpublic institutions and private individuals are in cooperation. These cooperative relations are entered into by every Bureau and do much to build up the local and State institutions as well as to benefit private individuals. An office is maintained in Washington for the special service of the State experiment stations and the agricultural colleges. Experts in this office do much toward encouraging and aiding the great oncoming movement for universal education in agriculture and home making and in making available to the technical workers the literature of research rapidly accumulating in this country and abroad. Agents of the Department are constantly studying the many experiments which are springing up all over the country as to kinds of schools which teach agriculture and home making, farms of courses of study, plans for practice instruction, and the educational side of apprenticeship in agriculture. In published courses of study for

agricultural colleges, agricultural high schools, consolidated rural schools, and for local public schools generally, has been brought into the hands of the leading educators in the Department and in the various State and local agricultural colleges. The public is coming to see that teachers trained to instruct in agriculture and home economics will soon be demanded by the tens of thousands of consolidated rural schools which will bring an agricultural high school to every neighborhood in each of our three-thousand agricultural counties. The demand which is growing very rapidly is destined to increase the work of our agricultural colleges and departments that the phenomenal development of the past dozen years will prove to be a grand preparation for the future.

Nor is the work of the home maker forgotten. The best that is known as to forms of schools and courses of instruction for country girls and farm women is being brought together and widely disseminated. Research in the manufacture and preparation of foodstuffs has also been a permanent feature in the work of the Department, and plans of education promulgated include the vocational education of the farm girl as well as that of her brother. Plans for educational efforts are not confined to the pupils of school age, but the nation-wide movement for department and college extension teaching in agriculture is encouraged. The short trade courses for the farmer and for special agricultural industries, the itinerant school, the farmers' institute, the farmers' institute train, addresses before farmers' associations, clubs, and granges; also demonstration farming, and actual visitations at farms to investigate and advise the individual farmer—these methods are constantly employed. Assistance is given for planning practical farms at every consolidated rural and village and other school where agricultural thought, and demonstration farms are conducted in nearly all the States and counties in the South.

For disseminating knowledge, improving agricultural methods, and bettering the conditions of life in the country, the Department finds no other means so widely useful nor so effective as the printed page. Its output of printed matter is enormous, and is increasing yearly. Last year the Department issued 1,200 different publications, more than half of which were new. These contained 42,000 printed pages. The number of copies issued by the Department exceeded 17 millions; and Congress provided for the use of its members and for the Supreme Court of Dooms an additional millions of copies. These publications range in size from a one-page leaflet to bound volumes of 1,000 or more pages. In style they range from the simplest description to the most technical exposition of scientific subjects. It should be said, however, that a large majority of these publications are best described as pamphlets written in plain every-day English which tell the farmers the how and the why of things agricultural. They reduce science to practice. And scattered through many of these pamphlets and books are pictures, charts, and maps reproduced from drawings made by the most competent artists, and from photographs. These are powerful aids. They carry the reader over the hard places in the text. They enable him to understand, and to reproduce in practice the lessons taught.

The popular publications are as a rule for free distribution to the public, and with little delay they go into the hands of practical farmers and others who read them and benefit by their teachings. The technical publications go into the hands of teachers and investigators in all fields of scientific endeavor. They form the basis of agricultural science and practice, and they aid in the building up of allied sciences. These publications go into thousands of public libraries, and hundreds of thousands of private libraries. They are widely used as reference books in our schools and colleges; and their use as text-books or for supplementary reading in our schools creates a wide and rapidly growing demand. In fact, without these publications the teaching of agriculture in our schools would be day by day impracticable.

The United States Department of Agriculture is the greatest research organization and the greatest educational institution in the world. It reaches the humblest farmer and homemaker, and provides graduate instruction to the graduates of our greatest universities. Its educational efforts deal with the thinking and with the doing of every rural occupation and with the science which deals with agricultural production and country life. And its educational efforts are not confined to those who farm and to those who deal with technical matters in agriculture. The Department carries its face to tens of millions of people; legislators sit at the feet of its scientific administrators; and courts often learn from its bureaus how to connect their business and decisions with the law. Its workers help the individual farmer and also give direction and assistance when he acts collectively in cooperative organization. It helps to form plans for his schools and other public and semipublic enterprises. It helps to build up State and local institutions and thus helps to counteract too much centralization of public effort. It has brought together and trained for this wonderful public service a body of most efficient, loyal, and even unconquerable workers. With salaries less than general commerce would pay, many of these men prefer to discover new truths or to hold a lever on the power behind great movements in which others are the public leaders, supplying facts and passing judgment on broad policies which affect the economic and social welfare of the whole people. Without knowing special interests, they make of Uncle Sam an agency of altruism along many lines. This organization and its work take men whose characters were formed in our schools, in our splendid homes, whose education was enlarged and specialized in our schools, and give them a chance through experience to gain efficiency in serving their country in ways as vital as these open to the statesman or the soldier.

No other Government department has the opportunity for such vital relation to the great mass of the people. In no other department does creative genius have such opportunities to serve the whole people. In no other department is there such inspiration which arises from successful efforts to solve the problems which relate to inanimate and animate nature. After all, the Department of Agriculture is but a part of the vast machinery of our national, State, and local public service, in which nearly two and a half billion dollars are used annually to enable all people to freely and successfully pursue their several roads to happiness. Science having had her kindly, yet firm, hand on our vocational life, a new era has dawned, and the truth will make everywhere free.

It is fortunate that at the time the world reached its permanent period of high prices for food and the raw products of clothing, it has also reached the efficient stage of agricultural science as an agency in making our soils productive, of breeding plants more efficient in utilizing the soils, and of breeding animals more efficient in utilizing a portion of our crops. The achievements of the Department of Agriculture as the great central leader in agricultural research and education at this juncture are of peculiar importance and of profound national and even racial interest. The foresight and optimism which have led to the development of a great corps of scientists, and to give each an opportunity to enter new fields of effort in the interests of the farmer, has resulted in developing a skeleton army at the time when the technicians and teachers in agriculture are in demand to produce an educated farmer for each of our several million farms. The Department of Agriculture is a great institution; but the most extensive, the most wealthy, and the brightest race of farmers on earth require no less a Department than that at Washington is and is to become. They are coming to see that they require a system of high schools in each neighborhood of every county, and that the agricultural department and colleges be open to the youth of every farm. And the prospect of universal vocational education for farm youth makes it easy to prophesy the large growth in store for the Department and for the State college of agriculture.

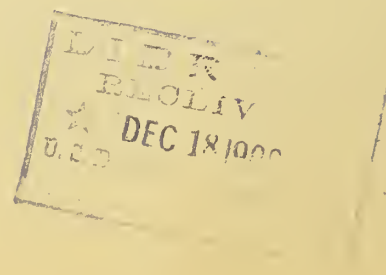
As now organized in America, it is conservative to say that agricultural science is on the 16 to 1 basis. For every dollar invested in one public department of agriculture and experiment stations for research more than \$10 are returned in increased products. And the dollar in agricultural education brings back nearly as many dollars as agricultural research, and, besides, it adds greatly to the comforts and the civilization of the people in the open country. We need to help agricultural and industrial education that we may have larger means with which to pay for our battleships. The man is the controlling factor in agricultural economies. Conserve and develop the great forces within him and he will develop the possibilities of our abused soils and of the beauty in our plants and animals. Give vocational education to our agricultural workers and to our nonagricultural workers and each will be able to produce so much per capita that each will be able and glad to pay high prices for the products of the other. And all will enjoy the comforts and civilization which larger production and a larger increment of wealth make possible.

Research, invention, management, consolidated capital and facilities, trained workers, and business organization, which are so rapidly increasing production in our country, are needed by the more backward nations quite as certainly as they need our religion. For example, the Orient needs our brand machine farming that a portion of those who are now required to do the hard labor under narrowly ancient methods of food production may be spared from that service to work at building homes, wagon roads, railways, and cities; and in manufacturing labor-saving machinery, in making books, newspapers, and other modern necessities. We can well afford to supply a surplus of teachers in agriculture, the trades, and industries and in home economies for the less advanced nations which modern transportation is placing in close competition with us. It is wisdom for us to make it easy for foreigners to enter our schools devoted to the manual vocation and to home economies. For the timeliness which may seem wrong national policy. It can not be wrong world policy, and all peoples are becoming one brotherhood. The sooner the inefficient peoples of the earth are brought up to that general standard of vocational and home-making efficiency of which their heredity makes them capable, the sooner will harsh economic competition between nations cease and the causes of war be dispelled. The old world would not be a peril if the Orient were on the same plane of vocational efficiency and the same plane of expenditure for living as the Occident. The great contests of the future may be in large part avoided by the vocational teacher carrying the science and the methods of productive industry and of home making to all peoples.

We are in the dawn throughout the world of the era of the application of science to agriculture, the industries, and home making. Let us be proud that our significant Department of Agriculture is the world's leader in this work; and let us be sure that we maintain that wisdom which lacks neither in knowledge, in breadth and feasibility of plan, nor in the largest patriotism which includes the interests of the productive workers and the home makers of all lands. Daily guarding and conserving our present national status, let us look broadly toward the day when the world is as secure as America is in science and morals.

While other departments of the Government conserve our institutions, administer our laws, and give service to our industries and to our homes, the Department of Agriculture deals with our one great vital resource, the soil, and creates new wealth. Everybody rejoices that an enterprising administration of its work has placed it on its present high plane of efficiency. All classes of people recognize that the expenditures for scientific agriculture are wise and should not be meager. Those interested in the departments of the Government which require large expenditures, as for war and incident to war, have come to recognize that expenditures to increase the productive capacity of our workers make strong the arm which wields the nation's big stick. Present public expenditures in agricultural advancement increase production at least half a billion dollars. The scientists and teachers are rapidly being developed who can multiply this increase by three, at such relatively small cost as to leave it nearly all for profit. The development of agricultural science can easily be made so productive as to add sufficient to the revenue of our farms as to be equal to the national expenditure, already over a billion dollars annually.

The possibilities are still in our soils, the demands are upon us not merely for additional breadstuffs, but for sufficient food for a rapidly multiplying population. We can somewhat increase our productive area, we must greatly increase our product per acre. The Department and our colleges and stations are showing those who are on the land and those who should be on the land how our soils can be made to produce food and clothing for all the people; and how our rural people can develop a most delightful, as well as our most vital, civilization in the open country. The Congress under whose initiative these institutions were created, and all the State legislatures which have cooperated in fostering and developing them, were never before so thoroughly convinced that their own works were good to behold. The future has in store for the industrial classes and the makers of their homes that degree of knowledge and efficiency which will make for a happiness far beyond the dreams of the greatest optimists of the nineteenth century. A decade has seen not only the transmission of thought on shafts of lightning sent through the air and the brilliant flight of man, but it has brought with it the vying hope that the billions of millions of the earth may find their tasks all made productive of comforts and even of luxuries.



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